Tailflation: Forecasting, Modelling and Managing it
Sam Worthington

Agenda

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<th>Why is inflation important?</th>
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<td>Managing inflation</td>
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Why is inflation important?

Inflation history
Impact of inflation on non-life insurance

- Sufficiency of reinsurance cover
- Solvency cover
- Reserve adequacy
- Business strategy: Risk of a "vicious cycle" of under-reserving and under-pricing
- Premiums and expenses in future underwriting years

Real Discount Rate

Context: low yield environment and inflation picking up

Inflation framework

Output gap: Potential vs Business cycle

Potential output (or structural/trend):
- Time horizon ~10 years
- Ignores current cyclical position
- Supply-side driven

Business cycle:
- Time horizon ~3-5 years
- Cyclical position paramount
- Demand-side driven

Real GDP level vs Time
Inflation expectations anchored

Monetary Policy (short term driver)
Commodity Prices (short term driver)

Debt fuelled growth (long term driver)
Debt fuelled growth (long term driver)

Productivity (long term driver)
Demographics (long term driver)

Country-level analysis: short term

<table>
<thead>
<tr>
<th>Factor</th>
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<th>UK</th>
<th>Germany</th>
<th>Japan</th>
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<td>Monetary policy</td>
<td>Expect low and slow rate rises from end 2015. Sensitivity to interest rate rises, so rising rates could slow demand and therefore restrict inflation QE ended</td>
<td>Expect low and slow rate rises from mid 2016. Sensitivity to interest rate rises, so rising rates could slow demand and therefore restrict inflation QE ended</td>
<td>QE extremely accommodative given position in debt cycle and weakening currency increases cost of imports and improves export competitiveness leading to higher demand</td>
<td>No-holds barred QQE trying to overcome entrenched low inflation expectations. Weaker currency increases cost of imports and improves export competitiveness, increasing demand</td>
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<td>Inflation expectations</td>
<td>Stable, low inflation expected</td>
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<td>Very low expectations below BOJ target inflation</td>
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<td>Commodity prices</td>
<td></td>
<td></td>
<td></td>
<td>Falling oil price</td>
</tr>
<tr>
<td>Output gap</td>
<td>Around - 1% of GDP and actual growth closing slowly on potential growth of 2 - 2.5%</td>
<td>Around - 0.5% of GDP and expected to close slowly on 2% potential growth.</td>
<td>Around + 1% of GDP. Economy likely to grow above potential in medium term, affecting goods or real assets (property)</td>
<td>Estimate neutral but very hard to say.</td>
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<td>Summary</td>
<td>Low positive inflation but with risk of deflation</td>
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<td>Inflationary environment due to low levels of slack and accommodative monetary policy, set with reference to Eurozone</td>
<td>Stalemate between Abenomics and entrenched views of inflation.</td>
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Country-level analysis: long term

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<td>Demographics 2012-22 (UN database)</td>
<td>Slightly growing Population growth: 0.8% Labour growth: 0.3%</td>
<td>Slightly growing Population growth: 0.8% Labour growth: 0.2%</td>
<td>Rapidly ageing Population growth: -0.2% and labour growth: -0.6%</td>
<td>Rapidly ageing Population growth: -0.2% Labour growth: -0.9%</td>
</tr>
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<td>Productivity</td>
<td>Appears to be long term declining productivity. Tech change is less transformative than in the past</td>
<td>Appears to be long term declining productivity, and recovery has been associated with &quot;productivity puzzle&quot;</td>
<td>Productivity of labour force expected to reduce due to ageing population</td>
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<td>Debt fuelled growth</td>
<td>Very high levels of household debt. Households expected to reduce debt relative to income, reducing demand growth</td>
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<td>Relatively low household and government debt for cultural reasons.</td>
<td>Astronominal government and reasonable household and corporate debt Government debt domestically funded and unsustainable in long term</td>
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<td>Global pressure</td>
<td>Disinflationary because high capacity in many economies, e.g. Eurozone, Japan and parts of China</td>
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<td>Summary</td>
<td>Deteriorating high levels of household debt expected to be main driver</td>
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<td>Declining labour productivity and low household debt offset by rapidly ageing population</td>
<td>Rapidly ageing population and government debt unsustainable to be funded in current form in long term without tax rises</td>
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</tbody>
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Managing inflation risk
Some views on managing inflation risk

1. “We ignore inflation risk – we assume it does not deviate from expected”
2. “We are in a low interest rate environment and the major risk is deflation so it’s not worth managing”
3. “Investible assets cannot hedge claims inflation entirely so there is no point using them”
4. “Claims inflation is slow to emerge. We monitor it but do not think further action is needed”
5. “We believe inflation is a risk and want to do more to manage it”
6. “We understand and manage inflation risk proportionately for our needs”

Risk has a time horizon dimension

Risk =

- Volatility of outcome at a particular time horizon?
- Predictability of outcome at a given time horizon?
- Volatility along a particular path?
Modelling
What matters in Inflation models?

Inflation Models

Modelling
What matters in Inflation models?

Inflation Models

Realised inflation

Capture regimes

Dependency with other variables

Mean target

Auto-correlation

Reduction in volatility through pooling risk

Reduce inflation-sensitivity of new business

Underwriting and product design (indexation clauses, claims made policies)

Transfer reserve exposure

Securitisation (sell ILS e.g. AXA's motor portfolio)

Reduce volatility through pooling risk

Portfolio management (change mix of business to reduce inflation sensitivity)

Diversification (across regions and insurance classes)

Mitigate impact of inflation

Reinsurance (XoL casualty covers, align indexation clauses with underlying policies)

LDI (invest in assets that provide returns linked to inflation)

Toolkit for mitigating, reducing or transferring inflation risk

13 November 2015
Assess Exposure: ASHE ; RPI ; AEI

Comparison of ASHE against RPI and AEI

Investment options for liability hedging

<table>
<thead>
<tr>
<th>FIXED INCOME</th>
<th>OTHER</th>
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<tbody>
<tr>
<td>• Ground Rent</td>
<td>• High dividend paying equity</td>
</tr>
<tr>
<td>• Long lease property</td>
<td></td>
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<tr>
<td>• Social housing</td>
<td></td>
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<tr>
<td>• Infrastructure debt</td>
<td></td>
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<tr>
<td>UK Corporate bonds</td>
<td></td>
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<tr>
<td>Inflation linked corporates</td>
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<tr>
<td>Global Inflation linked gilts</td>
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<tr>
<td>UK Inflation linked gilts</td>
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<td>Inflation swaps</td>
<td></td>
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<tr>
<td>4% target</td>
<td>0%</td>
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Expected total return (%pa)

Secured Income Assets

Standard deviation of expected returns (%pa)
One approach for hedging inflation risk

1. Identify inflation sensitivity of liabilities and beta to investible inflation measure (RPI)

2. Determine target hedge ratio (price; minimum risk; capital)

3. Select investments to achieve target hedge ratio (funding; investment policy / return target; other risks e.g. IR)